

CHAPTER 2.2
GROUND WATER EXTRACTION TRENCHES

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CHAPTER 2.2 GROUND WATER EXTRACTION TRENCHES

2.2-1. **GENERAL.** This section describes the installation of ground water extraction and recharge trenches. Extraction trenches are used to remove contaminated ground water while recharge trenches are used to reintroduce treated ground water back into the subsurface.

a. Equipment.

(1) Trench Excavating Equipment.

(a) Confirm that any drill rigs used have been inspected in accordance with the provisions of EM-385-1-1 (Chap. 16).

(b) Confirm that the contractor is maintaining records of tests and inspections on site.

(c) Verify that the trencher/backhoe is free from leaks of fluids and has been decontaminated prior to moving onto the project.

(d) Confirm that the trencher/backhoe is capable of achieving the required dimensions for the excavation.

(2) Personnel.

(a) Confirm with the Site Safety and Health Officer (SSHO) that all persons working in the exclusion zone meet OSHA requirements for training and medical surveillance and that they have read and signed the SSHP. They also must be wearing appropriate protective clothing as described in the SSHP.

(b) Confirm that the contractor who installs the ground water collection or injection trenches has the required licenses (state or local) to perform the work. Note that in some states a trench for extraction or recharge of ground water is classified as a well.

(c) Confirm that personnel and equipment decontamination and collection facilities are in place and conform with the specifications.

b. **Preconstruction Submittals.** The contractor should provide preconstruction submittals as required by the specifications. The following is a list of typical submittal requirements.

(1) Excavation and Installation Plan which describes:

- the trenching method and equipment;
- screen installation procedures;
- soil/rock logging procedures and forms;
- soil sampling and sample handling procedures;
- dewatering and water handling plan (if required);
- procedures to containerize, label and store potentially hazardous soils or liquids (if required);

- decontamination procedures;
- where required, well permitting information (copies of all permits must be maintained on site); and
- procedures to obtain digging permits/utility clearances.

(2) Verify that the trenching subcontractor has read the installation specifications prior to installation of the trenches.

(3) Qualifications for the trench installation contractor should be submitted if licences are required in that state. Note that some states consider ground water extraction and recharge trenches to be wells. Verify that the contractor's qualifications meet the specifications and any state requirements. The qualifications, including education and experience, of the geologist or engineer responsible for logging the materials encountered during drilling should also be submitted for information.

(4) Catalog information on:

- pump screen or slotted pipe and casing;
- cement and/or bentonite sealant;
- precast well head vaults (if applicable);
- piping;
- pump(s) and associated equipment;
- gauges and controls;
- electrical components;
- geosynthetic materials;
- backfill materials;
- slurry materials, e.g. bentonite, bioslurry; and
- gradation test results for filter pack material and pipe bedding/backfill (if required).

c. Construction Submittals. The contractor should provide construction submittals as required by the specifications. The following is a list of typical submittal requirements.

(1) Geologic logs for extraction and/or recharge trenches.

(2) Proposed trench locations or screen placement may be a submittal if trench construction was left to the contractor based on conditions encountered. This submittal should be provided to the design district for review and approval.

(3) Construction diagrams for all trenches and associated wells and piezometers. The contractor may be required to furnish these submittals to the design district for review and approval.

(4) Water yield test results for individual extraction (or recharge) wells. These are determined by performing a specific capacity test and are used to verify design assumptions. The

contractor may be required to furnish this submittal to the design district for review and approval.

(5) Backfill density test results, if required.

(6) Chemical sampling results from initial trench sampling. The contractor may be required to furnish this submittal to the designer for review and approval.

(7) Water level measurements and contour maps as required.

d. Start-up Submittals. The contractor should provide start-up submittals as required by the specifications. The following is a list of typical submittal requirements.

(1) Completed Start-Up Checklist. This checklist is used to ensure that the equipment and controls will perform safely and as expected.

(2) Start-Up Monitoring Plan. This plan identifies procedures for initial start-up of the system including step-by-step procedures for valve settings, circuit checks, energization, and monitoring. Plans for testing each trench individually in a multi-trench system including correct valve settings and range of acceptable flow rates in a step test should also be included. The step test consists of starting at a low flow rate (10 to 25 percent of the design flow rate) and stepping up in increments to the design and finally the maximum design flow rate. For reinjection trenches, it is critical that the test be of sufficient length to overcome the initial wetting of the soils so that the step test is carried out on saturated soils.

2.2-2. PRODUCTS.

a. Water. Verify that the source of any water used in the construction of the trench is approved in the specifications or chemical testing has been performed to verify it is of adequate quality. Note, use of water from sources with free chlorine may result in contamination of the well with trihalomethanes.

b. Below-Ground Equipment.

(1) Excavation.

(a) Confirm that the trench dimensions conform to the specifications.

(b) Verify that the trench is completed at the proper depth and/or in the appropriate geologic unit.

(c) Confirm that any material added to the bottom of the trench is not finer-grained than the adjacent materials.

(d) Confirm that the piping/screen is placed at the correct slopes.

(e) Determine that all safety procedures and egresses are in place before anyone enters trenches deeper than four (4) feet.

(2) Slotted Pipe/Screen.

(a) Verify that slot type, slot aperture, diameter, and

material (composition and wall thickness) are consistent with the specifications.

(b) Verify that any backfill material in the trench under the slotted pipe is the proper gradation, thickness, slope, etc.

(c) Slotted pipe/screen should be new and stored in a clean, safe location where it will not be damaged by equipment.

(d) Ensure that all connections are consistent with specifications and can be made water tight.

(e) Verify that all joints are cleaned prior to gluing.

(f) Ensure that appropriate safety procedures are followed before any person enters sumps or other subsurface structures to connect piping.

(3) Piping.

(a) Verify that casing schedule, diameter, joints and material meet specifications.

(b) Assure that joints can be made water-tight.

(c) Casing should be new and stored in a clean, safe location where it will not be damaged by equipment.

(d) Verify that all joints are cleaned prior to gluing.

(e) Above-ground piping must be UV resistant.

(f) Ensure that materials which will be in contact with the contaminants are compatible with the contaminants.

(4) Filter Backfill.

(a) Filter backfill must meet the required gradation.

(b) If no filter backfill gradation is given, check that the backfill is a uniform sand or gravel large enough to prevent entry of the pack through the screen slots.

(c) Check the specifications to see if the backfill must be washed.

(d) Verify that geotextiles placed on top of the filter material meet specifications for material properties and placement.

(5) Valves, Gauges and Vaults.

(a) Assure compliance with specification.

(b) Verify consistent diameters of vault penetrations with associated casing, piping, or utility conduits.

(c) Vault covers must be appropriate for traffic conditions if flush-mounted.

(d) Assure that adequate means of opening large vault covers is provided.

(e) Circular vault lids are preferable to rectilinear ones because they cannot fall into the vault and damage the system.

2.2-3. EXECUTION.

a. Trenching.

(1) Ensure that the contractor has made arrangements for emergency response, transport, etc.

(2) Confirm that the necessary notifications/permits have been obtained from the State, County or appropriate agency before trenching begins.

(3) Check that all utility clearances have been received for the subsurface work.

(4) Determine that the trench location is in accordance with the specifications. If it is impossible to install the trench in a specified location, determine the best alternate location that meets the requirements of the design. If there are any questions about a possible alternate location, contact the design district to confirm a new location.

(5) Confirm that safe excavating procedures are used and that an exclusion zone is well defined around the excavator. Also determine that required safety equipment is present and that it is operated in accordance with the requirements of the SSHP. Ensure that the sides of the trenches are benched or sloped according to the provisions of EM-385-1-1.

(6) If required, confirm that all excavated materials and liquids are containerized or covered in accordance with the specifications or approved work plan.

(7) Verify that samples are collected at the prescribed levels and that the geologist is logging the trench according to USACE guidelines.

(8) Verify that the trench is at the proper depth or geologic interval before allowing installation of the gravel pack and screen.

(9) Verify that grain size tests and calculations have been made to determine the appropriate screen size. Otherwise verify that the slot size of the screen is in accordance with the specifications.

(10) Determine that the dimensions of the trench are within the range allowed in the specifications.

(11) If unexpected debris or liquids are encountered in the hole, stop construction and notify the appropriate personnel including the Site Safety Officer. At some sites, potentially hazardous waste has been encountered while excavating.

(12) Ensure that site contingency plans for spills, releases, etc. are in place and discussed.

b. Installation.

(1) Verify that all materials to be installed in the trench are the correct diameter, length, size and grade as indicated in the

specifications. Materials should be clearly labeled in their original packaging or the labels should be fixed on the materials (e.g. PVC pipe).

(2) Check that screen materials are wrapped and sterile. If not, they must be decontaminated with a steam cleaner and wrapped to prevent contamination. Workers handling the unwrapped screen should wear clean (latex) gloves.

(3) Confirm that the screen is in the center of the trench.

(4) Determine that all of the backfill materials to be added are present in adequate amounts and that they meet the requirements of the specifications. If the backfill is stored on the ground without a plastic liner, the material in direct contact with the ground should not be added as backfill.

(5) Check that the grain size of the filter pack is compatible with the slot size of the well screen and that the filter pack meets all specifications for cleanliness, roundness etc.

c. Development. Development of trenches is much more difficult than development of wells. The goal of trench development is to remove fines so that they will not damage the final pumps or cause problems in the treatment process. The process involves using a development pump temporarily hooked into the extraction system that is not as susceptible to damage by fines. Usually the specifications will state a minimum number of hours of development and a minimum pumping rate. If the water does not clear up in the prescribed time, it will be necessary to collect a sample to determine the quantity of sediment still present and its constituents (silt, sand, etc.). Once this is done, discussions with the design district can determine whether additional development will be required.

d. Installation of Equipment.

(1) Ensure that the pumps that go in the trench correspond with the specifications.

(2) Verify that the pumps are installed at the designed level.

e. Trenches Containing Light Non-Aqueous Phase Liquids (LNAPL).

(1) Determine whether one or two pumps are to be installed in the trench.

(2) Ensure that the installer measures the depth to water and product in the trench.

(3) Confirm that the pump(s) are installed at the depth(s) required in the specifications. This is usually referenced to depths above or below the water/product interface.

f. Manhole or Doghouse.

(1) Ensure that the structures comply with the plans and specifications.

(2) Check that all the equipment and piping are properly installed and that all equipment, valves and meters are accessible and readable.